

## CLAIMS

What is claimed is:

1. A laser digitizer comprising:
  - a light source having collimating optics configured to generate a collimated beam of light;
  - a scanner optically coupled to the light source and configured to scan the collimated beam along at least two axes towards an object to be imaged;
  - an image capture instrument having an optical axis at an angle  $\theta$  with respect to the scanner and configured to detect a reflection of the scanned beam from the object and to generate data representative of a surface of the object based on the reflected beam;
  - a processor coupled to the scanner and the image capture system configured to generate a three-dimensional image of the object based on the data.
2. The laser digitizer of claim 1 where the light source comprises a laser LED.
3. The laser digitizer of claim 1 further comprising a flat-field scan lens having an optical axis and configured to focus the scanned beam of light to a point on the object to be imaged.
4. The laser digitizer of claim 3 where the image capture instrument comprises:
  - an image sensor configured to detect a triangulation image of the object, the triangulation image based on a plurality of curves generated by scanning the beam of light on the object during an exposure period; and
  - a telecentric lens configured to focus the plurality of curves on the image sensor.

5. The laser digitizer of claim 4 further comprising an object positioning system configured to position the object within a field of projection of the scanner.
6. The laser digitizer of claim 5 where the object positioning system is configured to move the object to various positions and angles with respect to a field of view of the image sensor instrument and the scanner.
7. The laser digitizer of claim 6 where the processor is programmed to merge multiple images of the object to create a three-dimensional map of the object.
8. The laser digitizer of claim 8 where the object comprises any one of a dental model, a dental mold, or a dental casting.
9. The laser digitizer of claim 1 where the scanner comprises multiple mirrors, where each mirror is positioned substantially orthogonally with respect each other.
10. The laser digitizer of claim 1 where the scanner comprises a rotatable mirror and a spinning polygon mirror.
11. The laser digitizer of claim 1 where the scanner further comprises a programmable position controller configured to control the scan of the collimated laser beam to a programmed scan sequence.
12. The laser digitizer of claim 1 where the known pattern comprises a plurality of curves where each of the plurality of curves is substantially parallel to each other.

13. A dental imaging system, comprising:  
means for generating a collimated laser beam of light;  
scanner means for generating a multi-axis collimated light beam;  
beam focusing means for focusing the collimated light beam to a point on an object to be images;  
image capturing means for detecting reflections of the a focused beam projected on an object; and  
processor means coupled to the scanner means and the image capturing means for generating a three-dimensional image of the object.
14. The laser digitizer of claim 12 where the scanning means scans the dot across the surface of the object via the focusing means in a selected pattern.
15. The laser digitizer of claim 12 where the image capturing means comprises:  
an image sensor configured to detect a triangulation image of the object, where the triangulation image is based on a pattern of scanned lasers dots across the surface of the object during an exposure period; and  
an imaging lens.
16. The laser digitizer of claim 14 further comprising object positioning means configured to position the object within a field of projection of the scanner.

17. A method that generates a three-dimensional visual image of a physical object comprising:

- generating a multi-axis collimated beam of light;
- positioning the object in a first position;
- scanning the multi-axis collimated beam of light in a predetermined pattern, where the pattern includes a plurality of substantially parallel curves;
- focusing the scanned collimated beam of light on the physical object;
- capturing an image of the focused collimated beam of light on the object during an exposure period; and
- determining a map of the surface of the object based on the captured image.

18. The method of claim 17 where the act of scanning comprises scanning the beam of light in a direction substantially perpendicular to the optical axis of the lens.

19. The method of claim 17 further comprising the acts of:

- re-positioning the object to a second orientation;
- capturing an image of the focused beam on the object positioned in the second position; and
- merging the image of the focused beam on the object positioned in the first position with the image of the focused beam on the object in the second position.

20. The method of claim 17 where the plurality of curves each comprise a plurality of curvilinear segments.